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EXAMINER

COLEMAN, ERIC

ART UNIT	PAPER NUMBER
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2183

DATE MAILED: 05/10/2004

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Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/736,682

Applicant(s)

BUDROVIC ET AL.

Examiner

Eric Coleman

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-81 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-36 and 39-81 is/are rejected.
- 7) ☒ Claim(s) 37,38 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date No. 2.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_.

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1,2,6-9,14-15,40-41,45-47,61,62,66-68,81 are rejected under 35 U.S.C. 103(a) as being unpatentable over Siska (patent No. 6,263,429) in view of Takano (patent No. 6,587,939).

3. Siska taught the invention substantially as claimed including data processing ("DP") system comprising:

4. A means and method for populating a first storage mechanism with the identified first plurality of uncompressed instructions (e.g., see col. 8, lines 6-63); and

b) Means and method for generating a first compressed computer program by replacing each of a plurality of identified first plurality of uncompressed instructions in the initial computer program with a respective first type of compressed instruction that identifies a location of the corresponding uncompressed instruction in the first storage mechanism (e.g., see col. 8, lines 6-63).

5. Siska did not expressly detail scanning an initial computer program to identify a first plurality of uncompressed instructions therein having a high frequency of use.

Takano however taught (e.g., see col. 11, lines 3-59) instruction frequency detecting unit that scans the instruction sequences and compares the instruction sequences to

instruction templates to detect instruction sequence occurrence frequency. Takano taught compressing the uncompressed instructions that were detected to occur at the highest frequency (e.g., see col. 11, lines 47-59).

6. It would have been obvious to one of ordinary skill in the DP art to combine the teachings of Siska and Takano. One of ordinary skill would have been motivated to use incorporate the Takano teaching of scanning for the instruction sequences of high frequency for performing compression this would allow compression of instruction while speeding up the compression/decompression of instructions without unnecessarily filling storage with seldom used uncompressed instructions (e.g., see col. 1, line 50-col. 2, line 32 of Takano).

7. As per claim 2,15,41,62 Takano taught program and processor specific scanning for the instructions of high frequency of use for compressing instructions (e.g., see col. 1, line 50-col. 2, line 32 of Takano). Therefore one of ordinary skill would have been motivated to populate separate mechanism that were used to compress separate programs that were used for different processors such in a system that comprised plural processors.

8. As per claim 6,45,66 Siska taught a system that would have required at least two bits to define to instruction type because Siska taught more than two different instructions (e.g., see figs. 5a,5b).

9. As per claims 7,8,46,47,67,68 Siska taught each of plural lines of code (uncompressed) with microcall (compressed code) contained therein (e.g., see col.7, lines 19-41). These lines of code comprised plural single data structures. Therefore (as

per claim 9) the populating of the storage mechanism would have included populating plural lines of code with compressed microcode .

10. Claims 3-5,42,43,44,63-65 are rejected under 35 U.S.C. 103(a) as being unpatentable over Siska in view of Takano as applied to claims 1,2,42 above, and further in view of Henkel (patent No. 6,691,305).

11. As per claim 3,42,63, Henkel taught identifying addresses referenced in the initial computer program and used by instruction that transfer control before the generating the first compressed computer program (e.g., see figs. 2,3,4,5 and col. 12, line 10-col. 14, line 44).

12. It would have been obvious to one of ordinary skill in the DP art to combine the teachings of Siska and Henkel. One of ordinary skill would have been motivated to incorporate the Henkel teachings of updating the branch targets in the compressing of instructions in order to ensure that the compressed code for the branch instructions operate properly when decompressed and executed.

13. As per claim 4,5,43,44,64,65 Henkel taught calculating new addresses for the first computer program instructions; determining if the identified addresses that are used by instructions that transfer control have changes in response to the step of calculating new addresses for the first compressed computer program instructions; and updating each identified address that is referenced in the first compressed computer program and had changed with the calculated new address that corresponds thereto (e.g., see fig. 5 and col. 14, line 45-col. 15, line 47). One of ordinary skill would have been

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motivated to perform the updating for plural storage mechanisms to provide separate control for the plural programs that operate on the plural processors as taught by the processor specific scanning of Takano described above.

***Claim Rejections - 35 USC § 102***

14. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

15. Claims 10,11,48, 49,69,70 are rejected under 35 U.S.C. 102(e) as being anticipated by Siska (patent No. 6,263,429).

Siska taught the invention as claimed including data processing ("DP") system comprising:

a) Means and method for scanning initial computer program to identify a first plurality of uncompressed instructions based on a first compression criterion (e.g., see fig. 3c);

b) Means and method for populating a first storage mechanism with the identified first plurality of uncompressed instructions (e.g., see col. 8, lines 6-63); and

c) Means and method for generating a first compressed computer program by replacing each of a plurality of identified first plurality of uncompressed instructions in the initial computer program with a respective first type of compressed instruction that

identifies a location of the corresponding uncompressed instruction in the first storage mechanism (e.g., see col. 8, lines 6-63).

16. As per claims 11,49,70 Siska taught each of plural lines of code (uncompressed) with microcall (compressed code) contained therein (e.g., see col.7, lines 19-41).

These lines of code comprised plural single data structures. Therefore (as per claims 11,70) the populating of the storage mechanism would have included populating plural lines of code with compressed microcode or in other words plural storage mechanisms.

17. Claims 16,17,20-22,31-36,39,52,53,56,57,58,73,74,77-79, is rejected under 35 U.S.C. 102(e) as being anticipated by Henkel (patent No. 6,691,305).

18. Henkel taught the invention as claimed including a data processing ("DP") system comprising:

19. Means and method for decoding means an method for decomposing a uncompressed program comprising object code instruction into four predetermined types or classes depending on a tag (e.g., see col. 13, lines 2-col. 14, line 44). Henkel taught the use of tag bits to determine whether the instruction was compressed (e.g., see col. 25, line 48-col. 26, line30) by indicating the number of bytes the instruction comprised. Henkel taught locating the uncompressed code corresponding to the compressed instruction depending on the type of compressed instruction and combining the uncompressed operand and non-operand data within the corresponding data structures to provide the uncompressed instructions (e.g., see figs. 19, 11a, 11b, 11c, 11d, 11e, and col. 25, line 48-col. 28, line 46 and col. 19, line 18-col. 20, line 15).

20. As to the further limitations of claims 17,21,22,31,36,53,57,58,74,78,79 the Henkel system specifically detailed a compression engine (e.g., see figs. 17,18,19) coupled to main memory (4) (e.g., see fig.17). The Henkel system taught within the compression engine plural subcompression engine means for decompressing different types of instructions (e.g., see (figs. 1,2,3,4,5 and 19). Henkel taught tags that associated the types of compress instructions with the partial uncompressed instructions (e.g., see col. 25, line 48-col. 26, line 48).

21. As per claim 39, Henkel taught a buffer having data input that is communicatively coupled to main memory (e.g., see figs. 17,18,19) for receiving the received instruction from main memory, a data output that is coupled to the data input to the instruction type decoding unit and a reset input that is coupled to the jump signal (e.g. see figs. 19,20)

***Claim Rejections - 35 USC § 103***

22. Claims 12,50,71 are rejected under 35 U.S.C. 103(a) as being unpatentable over Siska as applied to claims 10,11,49,70 above, and further in view of Takano (patent No. 6,587,939).

23. Siska did not expressly detail scanning an initial computer program to identify a first plurality of uncompressed instructions therein having a high frequency of use. Takano however taught (e.g., see col. 11, lines 3-59) instruction frequency detecting unit that scans the instruction sequences and compares the instruction sequences to instruction templates to detect instruction sequence occurrence frequency. Takano taught compressing the uncompressed instructions that were detected to occur at the



highest frequency ignored at least a portion of the operand in the frequency determination (e.g., see col. 11, lines 47-59).

24. It would have been obvious to one of ordinary skill in the DP art to combine the teachings of Siska and Takano. One of ordinary skill would have been motivated to use incorporate the Takano teaching of scanning for the instruction sequences of high frequency for performing compression this would allow compression of instruction while speeding up the compression/decompression of instructions without unnecessarily filling storage with seldom used uncompressed instructions (e.g., see col. 1, line 50-col. 2, line 32 of Takano).

25. Claims 13,51,72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Siska in view of Takano as applied to claims 10,48,69 above, and further in view of Henkel (patent No. 6,691,305).

26. Henkel taught the use of processor performance or penalty to clock speed in determining the type of compression to invoke. (e.g., see col. 24, lines 11-67 and col. 25, lines 35-47).

27. It would have been obvious to one of ordinary skill in the DP art to combine the teachings of Siska and Henkel. One of ordinary skill would have been motivated to incorporate the Henkel teachings of use of performance penalty in the determination of the type of compression to perform at least to ensure that the system performance is not reduced when the compression is invoked.

28. Claims 18,19,23,24,25,26-30,54,55,59,60,75,76, are rejected under 35 U.S.C. 103(a) as being unpatentable over Henkel (patent No. 6,691,305).

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29. Henkel taught the invention substantially as claimed including a data processing ("DP") system comprising:

30. Means and method for decoding means an method for decomposing a uncompressed program comprising object code instruction into four predetermined types or classes depending on a tag (e.g., see col. 13, lines 2-col. 14, line 44). Henkel taught the use of tag bits to determine whether the instruction was compressed (e.g., see col. 25, line 48-col. 26, line 30) by indicating the number of bytes the instruction comprised. Henkel taught locating the uncompressed code corresponding to the compressed instruction depending on the type of compressed instruction and combining the uncompressed operand and non-operand data within the corresponding data structures to provide the uncompressed instructions (e.g., see figs. 19, 11a, 11b, 11c, 11d, 11e, and col. 25, line 48-col. 28, line 46 and col. 19, line 18-col. 20, line 15).

31. Henkel did not expressly detail (claims 18,19,23,24,54,55,59,60,80,81) whether the data structure that was located for decompression was a single data structure of two data structures. However, One of ordinary skill would have been motivated to provide a data structure for branch instructions to be compressed where the target address is immediate or within the branch instruction, and also two data structures where the branch instruction was an indirect branch namely the address of the target was the contents of a location pointed to by the operand of the instruction to be compressed.

32. Henkel did not specifically detail (claim 25) removing the decoded instruction from the buffer. One of ordinary skill however would have been motivated to remove the instruction in the buffer used to store instructions to be compared for compressing the

instruction at least to provide room for succeeding instructions in the program to be compared for compression (e.g., see col. 29, lines 36-65).

33. As per claims 26,27 Henkel taught decompressing the decoded compressed instructions (including comparing the address from the processor with previous instruction address) and providing as output of the decompression unit(e.g., see col. 25, line 48-col. 26, line 48 and figs. 17,18) As per claim 28, Henkel taught registers (71) and other means for latching the instructions and data (e.g., see fig.19). As per claim 29, Henkel taught a storage location storing two instructions (e.g., see fig.11b) and shifting the data to/from the buffers (e.g., see fig.19).

34. As to the further limitations of claim 30, Henkel taught loading the buffer with a branch instruction, decoding the branch instruction and if the is no immediate field then loading the buffer with the instruction located at a received instruction address ,decoding the instruction to determine if the instruction is compressed or decompressed (e.g., see col. 13, line 4-col. 14, line 23 and fig. 19).

#### ***Allowable Subject Matter***

35. Claims 37,38 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

#### ***Conclusion***

36. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Worrell (patent No. 5,905,983) disclosed a microprocessor adapted for executing both non-compressed fixed length instruction set and a compressed variable length instruction set (e.g., see abstract).

Lee (patent No. 6,654,874) disclosed a microprocessor system having compressed instruction processing (e.g., see fig.1 and abstract).

Auerbach (patent No. 6,199,126) disclosed a processor transparent on-the-fly instruction stream decompression (e.g., see fig.2 and abstract).

May (patent No. 6,654,314) disclosed a system with computer instruction compression (e.g., see abstract).

Breternitz (patent No. 6,484,228) disclosed a system for data compression and decompression for a data processing system (e.g., see abstract).


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric Coleman whose telephone number is (703) 305-9674. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie Chan can be reached on (703) 305-9712. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

EC



ERIC COLEMAN  
PRIMARY EXAMINER

May 6, 2004